MIT PPST

Program in Polymer Science and Technology

POLYMER SEMINAR

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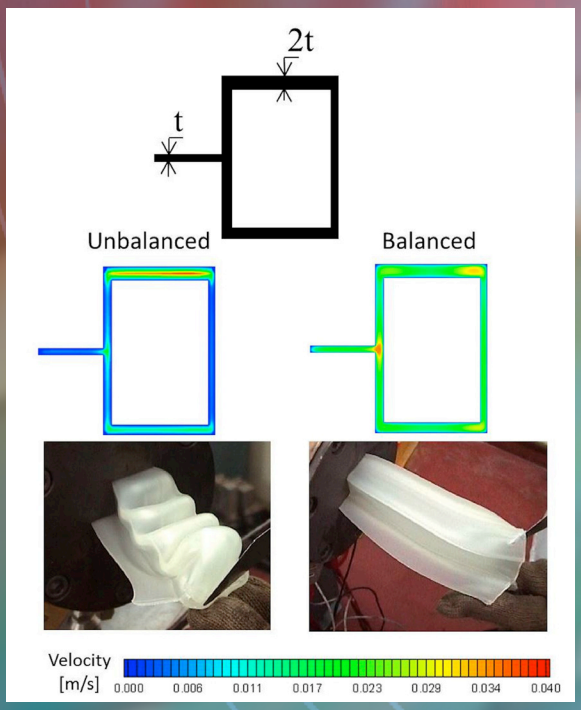
"Design of Extruded Profile Forming Tools"

Summary

The inherent design freedom promoted by the use of thermoplastic profiles is one of the major reasons for their attractiveness. Theoretically, thermoplastic profiles can be produced with any cross section, tailored for a specific application. However, the usually employed design procedures, based on experimental trial-and-error approaches, are highly dependent on the experience of the persons involved and require a large amount of resources. Often, these limitations either inhibit the accomplishment of a satisfactory solution, or increase significantly the profiles final price, despite the low cost of the raw materials employed. As a consequence, novel design methodologies are required to allow the full exploitation of these products.

In a typical extrusion line for the production of profiles, the polymer pellets are melted, in an extruder; then the melt is shaped to a cross section similar to that required for the final profile and, finally, cooled down to assure a proper mechanical resistance. Extrusion die is the tool that shapes the polymer melt, and should be designed to promote an even distribution of the flow at its outlet, while the profile cooling is undertaken inside the calibrator, which should guarantee a fast and uniform cooling rate, to assure high production rates and to avoid the development of thermal residual stresses.

The forming tools of the extrusion line, i.e., the die and the calibrator, are the components that play a crucial role in the establishment of the product dimensions, morphology and properties, and are also the ones that define the maximum allowable production rate. During the last decade our research group has been involved on the development of methodologies for the design and optimisation of extrusion forming tools, aiming the implementation of automatic design procedures. In this presentation the current state of the developed tools and methodologies will be described and the most relevant short term objectives will be pointed out.



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